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Satisfaction of cardiac surgery trainees with the residency training program in Saudi Arabia: a survey-based study

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Abstract

Background There is a direct relationship between the degree of trainees' satisfaction and their productivity. The Saudi Board of Cardiac Surgery is a new training program established by the Saudi Commission for Health Specialties. As a result, we aimed to provide helpful information and data in order to improve the overall quality of the local cardiac training program. This is the first study to look at how satisfied residents are with the Saudi cardiac surgery training program.

Results The study included 55.3% central region residents ($N=26$), 31.9% western region residents ($N=15$), and others from other regions, resulting in a total of 47 participants out of 60 with a 78.3% response rate. Only 42.6% of all residents were satisfied with their training in the Saudi Board of Cardiac Surgery program, 23.4% were neutral, and 34.0% were dissatisfied with the program. The most essential area for improvement was operative experience (63.8%), followed by workplace climate (8.5%) and mentorship (6.4%), whereas the area least in need of improvement was research opportunities (2.1%).

Conclusions Our results indicate a decline in satisfaction level with the training program. In reference to our findings, implementing simulation-based surgical learnings and providing more frequent exposure to Boot Camp experience in cardiac surgery is recommended. Adequate and constant mentoring, and constructive feedback, represent a valuable resource for improvement theoretically and surgically.

Keywords Cardiac surgery, Satisfaction, Residency program, Surgical exposure, Training

Background

The term “residency” refers to a period of training in a particular medical specialty after graduation from medical college. The training duration is based on a specialty

curriculum recognized by The Saudi Commission for Health Specialties (SCFHS) in Saudi Arabia. Case diversity, resident autonomy, stress, service expectations, structure, supervision, and other factors influencing the educational experience varies between residency programs [1]. Documentation regarding program satisfaction is limited; information on the general work environment, call demands, usual workweek, and sufficiency of additional support would be helpful to both medical students looking for residency programs and institutions looking for standards for assessing their own programs [2].

The Saudi Board of Cardiac Surgery is a new residency program that adheres to the Saudi Medical

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Education Directions for Cardiac Surgery training program (SaudiMED-CS), which was conceptually adapted from the Canadian Medical Education Directives for Specialists framework (CanMEDS) and is regulated directly by the Saudi Commission for Health Specialties (SCFHS) [1]. It began accepting residents in 2011. Every year, the program receives 40 applications and selects 10 residents every 2 years (an average of 5 per year). Accredited centers at that time were few and now reach 11 centers throughout Saudi Arabia, resulting in an increase in the number of residents accepted each year. The acceptance rate of residents is still low, which is logical, because cardiac surgery is well-known for being a high-stress field requiring long years of training (7 years) and a significant level of effort and commitment. Multitasking, prioritizing, and maintaining a proper balance are all necessary skills [1]. Furthermore, cardiac surgeons play an essential role in training residents in cardiac surgery, an increasingly difficult task as cardiac surgery becomes more advanced [3–5], and given the increasing complexity of cardiac surgery, the culture of surgical education is important to the success of a training program [5]. The Cardiac Surgical training of the Saudi Cardiac Surgery Board is divided into two phases: the junior phase, and the senior phase. The junior phase is a 5-year phase which is further divided into 3 years focusing on General Cardiac Surgery and the last 2 years are aimed towards Specialty Cardiac Surgery training. Junior residents are required to work on their knowledge based on Basic science and technical skills, plus their surgical judgment efficiency. The senior phase is a 2-year Specialty Cardiac Surgery training where the trainees are required to be engaged in hospital activities including the basic and clinical side. Then, the training requirements are decided based on the rotation. The laws of the kingdom, training obligations and regulations of the SCFHS, and the training centers' policies must be followed by the trainees. The training requirements for each phase are delivered in detail for the residents to refer to in the Cardiac Surgery Program Booklet, and the trainees are encouraged to refer to the SCFHS whenever they need to [1]. Cerqueira et al. state that, regardless of significant disparities in the standard and framework for cardiothoracic surgery training throughout Europe, residents are happy and satisfied with their education. Increased structured feedback, improved compliance with working hours, and incorporation of research time are all potential areas for development. This may be supported by the creation of European rules on training standards that each center must follow [6].

Trainee satisfaction is essential since studies have shown that high training satisfaction is connected with

higher residency performance and productivity [7]. We were interested in analyzing how satisfied residents are with the Saudi cardiac surgery program because it has a significant impact on their productivity and there has been no study on it yet in Saudi Arabia.

Methods

This is a survey-based descriptive cross-sectional study that was approved by the institutional research board of King Abdullah Medical City in Makkah during the academic year 2022–2023. (Approval No. H-02-K-001–22-978-). This study targets all cardiac surgery residents (PGY-1 to PGY-7) in the Kingdom of Saudi Arabia. All cardiac surgery resident has been contacted personally to complete the survey; they have been informed that no identifying information is needed. Data was protected by only allowing authorized access. The only requirements for eligibility were to be a cardiac surgery resident in the Saudi Board program and to have completed at least three months of training in the cardiac surgery department during the survey period. Rotators from other specialties and cardiac surgery residents who refused to participate in the study were excluded. Based on the available literature that had objectives similar to ours, we used a structured self-administered questionnaire [7]. Following the recommendations of the experts in cardiac surgery, the necessary changes were performed. To ensure the questionnaire's neutrality, it has been revised by cardiac surgery experts. In addition to demographic questions, the questionnaire focused on 22 parameters to assess cardiac surgery residents' satisfaction with the Saudi training program. The questionnaire was divided into three sections: overall program features, conceptual and surgical education, future goal, recommendations, and satisfaction rate.

Statistical analysis

The data has been analyzed using Statistical Packages for Social Sciences (SPSS) version 28 (IBM Corp., Armonk, NY, USA) after it had been gathered, coded, and cleaned. The degree of satisfaction of residents with the Saudi Board of Cardiac Surgery program was measured using the following question: "How would you rate your overall satisfaction with your Saudi Board of Cardiac Surgery residency program?" The results were interpreted using a five-point Likert scale, with possibilities ranging from "not satisfied at all" [1] to "very satisfied" [5]. In our study, the five-point Likert scale was separated into three categories: 1 and 2 were deemed unsatisfied, 3 were deemed neutral, and 4 and 5 were deemed satisfied. Both descriptive analysis and correlations were carried out. All categorical variables in descriptive statistics were provided in tables with numbers and percentages. Using Pearson

chi-square and Fisher's exact tests for tiny frequency distributions, the degree of satisfaction with the Saudi Board of cardiac surgery residency program was compared to the different features of residents. As a result, nonparametric tests were used. For statistical significance, a P value of less than 0.05 was used.

Results

A total of 47 out of 60 residents eligible for our criteria were included, with 26 (55.3%) from the central region, 15 (31.9%) from the western region, and others from other areas. The ages of the residents ranged from 23 to 33 years old, with a mean age of 29.2 ± 2.6 years old. 29 (61.7%) were male, and they were distributed from PGY-1 to PGY-7 residency years. A total of 25 (53.2%) were single and 22 (46.8%) were married; of the married group, only 11 (47.8%) had children.

Residents' Sociodemographic Features in Relation to Overall Satisfaction with Saudi Board Cardiac Surgery Residency Program. Age group ($P=0.397$), gender ($P=0.856$), marital status ($P=0.296$), duration to get to work ($P=0.680$), having children ($P=0.286$), type of training hospital ($P=0.723$), and none of the other factors had a significant association with the level of satisfaction. Additional details regarding the sociodemographic features of residents that correlate to their overall satisfaction is provided. Only residency training level showed significant association with satisfaction level, where satisfaction was higher among core and junior residents (60%) than among senior residents (22.7%; $P=0.039$) (Table 1).

General Program Features in Relation to Overall Satisfaction with the Saudi Board Cardiac Surgery Residency Program. Twenty-six (55.3%) were at a central region program, 15 (31.9%) were at a western region program, and 6 (12.8%) were at an eastern region program. A total of 44 (93.6%) were trained at tertiary hospitals and 21 (44.7%) were in a joint program. Exactly 23 (48.9%) had 1–5 residents currently in the program, and 40 (85.1%) had no cardiac surgery fellows currently training in the center. Also, 33 (70.2%) work for 60–90 h per week, and 20 (42.6%) had 5–6 overnight call shifts per month. Exactly 63.8% agreed that the program's faculty and staff are concerned about their educational progress, and 61.7% said they would pick the same cardiac surgery residency program again if given the opportunity, 53.2% agreed that program offers enough research opportunities and only 40.4% agreed that program uses resident feedback constructively. However, the program according to 40.4%, has a lot of ambiguity and vagueness. Residents' program satisfaction was significantly associated with reporting that faculty and staff in the program care about their educational success ($P=0.001$), agreeing that the program uses resident feedback constructively

($P=0.007$), and saying that they would pick the same cardiac surgery residency program again if given the chance ($P=0.018$) (Table 2).

Conceptual education in relation to the overall satisfaction with the Saudi Board Cardiac Surgery Residency Program. Thirty-nine (83%) used external sources, such as videos, to understand concepts, 31 (66%) sometimes find difficulty understanding cardiac surgery related concepts, and 25 (53.2%) found a mentor who could help them understand difficult concepts. Also, 21 (44.7%) do 1 teaching activity weekly in the program, and 61.1% said that teaching activities benefit them 4 and 5 out of 5. Exactly 40.4% often got academic instruction from attending physicians, whereas 20 (42.6%) received feedback from the department head and attending doctors, but not enough. A total of 15 (31.9%) said that the attending doctors were too busy to discuss patient problems in a timely manner. The most reported preferred learning modality was attendings' patients/case (63.8%), which was applied and commonly used among 25 (53.2%) students. When comparing satisfaction levels, finding a mentor who is willing to help you understand difficult concepts ($P=0.006$), finding the teaching activities beneficial ($P=0.014$), often receiving academic instruction from attending physicians ($P=0.003$), receiving feedback from the department head and attending doctors ($P=0.001$), finding the attending too busy to discuss patient problems in a timely manner ($P=0.013$), and applying attendings' patients/case in teaching ($P=0.008$) were significantly associated factors (Table 3).

Surgical education in relation to the overall satisfaction regarding Saudi Board Cardiac Surgery Residency Program. Attending physicians provided surgical instructions only to 29.8% of residents in the operating room, and 74.4% said that they benefitted from intra-operative teaching 4 or 5 out of 5. Only 19.1% prefer explanatory surgical videos of the operations more than intra-operative teaching, and 68.1% find difficulties in certain surgical skills. A total of 71.4% said that there was usually a mentor available to assist them in practicing surgical skills that they had difficulty with, and 25.6% assessed the educational curriculum in their cardiac surgery program as satisfactory. About 38.4% perform 10 surgeries or more as a first assistant or primary surgeon while 72.3% did not perform surgeries under general anesthesia as primary surgeon. Exactly 46.8% mark patients preoperatively on their own. As for supervision, 21.3% reported that they often or always feel they are being inadequately supervised during a procedure and 19.1% feel overly supervised during a procedure. When relating to resident's satisfaction regarding the program, all factors were significantly associated with resident's satisfaction level ($P < 0.05$), except for preferring explanatory surgical

Table 1 Residents' sociodemographic features in relation to overall satisfaction with Saudi Board Cardiac Surgery Residency Program

Socio-demographics	Total		Level of training satisfaction						p value
			Satisfied		Neutral		Dissatisfied		
	No	%	No	%	No	%	No	%	
Age in years									
< 30	23	48.9%	12	52.2%	4	17.4%	7	30.4%	.397
30+	24	51.1%	8	33.3%	7	29.2%	9	37.5%	
Gender									
Male	29	61.7%	13	44.8%	7	24.1%	9	31.0%	.856
Female	18	38.3%	7	38.9%	4	22.2%	7	38.9%	
Residency training level									
Core general surgery	15	31.9%	9	60.0%	2	13.3%	4	26.7%	.039* [§]
Junior cardiac surgery	10	21.3%	6	60.0%	0	0.0%	4	40.0%	
Senior cardiac surgery	22	46.8%	5	22.7%	9	40.9%	8	36.4%	
Marital status									
Single	25	53.2%	8	32.0%	7	28.0%	10	40.0%	.296
Married	22	46.8%	12	54.5%	4	18.2%	6	27.3%	
Have children									
Yes	11	47.8%	4	36.4%	3	27.3%	4	36.4%	.286 [§]
No	12	52.2%	8	66.7%	1	8.3%	3	25.0%	
Type of training hospital									
Primary	2	4.3%	1	50.0%	0	0.0%	1	50.0%	.723 [§]
Secondary	1	2.1%	1	100.0%	0	0.0%	0	0.0%	
Tertiary	44	93.6%	18	40.9%	11	25.0%	15	34.1%	
How much time does it take to get to work?									
< 30 min	32	68.1%	15	46.9%	7	21.9%	10	31.3%	.680
> 30 min	15	31.9%	5	33.3%	4	26.7%	6	40.0%	
How many publications do you have?									
None	8	17.0%	3	37.5%	2	25.0%	3	37.5%	.861 [§]
1	10	21.3%	5	50.0%	3	30.0%	2	20.0%	
2–3	18	38.3%	6	33.3%	4	22.2%	8	44.4%	
4+	11	23.4%	6	54.5%	2	18.2%	3	27.3%	
Have you ever failed a residency promotion exam?									
Yes	5	10.6%	1	20.0%	1	20.0%	3	60.0%	.307 [§]
No	24	51.1%	9	37.5%	8	33.3%	7	29.2%	
New curriculum has no promotion exam	18	38.3%	10	55.6%	2	11.1%	6	33.3%	

P Pearson χ^2 test[§] Exact probability test* $P < 0.05$ (significant)

videos of the operations more than intra-operative teaching, finding difficulties in certain surgical skills, number of monthly surgeries, and participating in complex procedures (Table 4).

Residents' perceptions of overall satisfaction with the Saudi Board Cardiac Surgery Residency Program. Exact of 42.6% were satisfied with their current case volume, 61.7% believe the number of residents in the department is optimal, 40.5% are satisfied with the number of cardiac

surgeries they have been exposed to (4 or 5 out of 5), and 34% believe they will be able to perform surgeries independently at the end of the residency, while 44.7% believe they will be partially able. All these factors were significantly associated with resident's overall satisfaction level regarding the program except for the number of available residents (Table 5).

In terms of overall satisfaction, 42.6% of residents were satisfied with their training in the Saudi Board of

Table 2 General program features in relation to overall satisfaction with the Saudi Board Cardiac Surgery Residency Program

Program characteristics	Total		Level of training satisfaction						p value
			Satisfied		Neutral		Dissatisfied		
	No	%	No	%	No	%	No	%	
Residency program region									
Central region	26	55.3%	8	30.8%	10	38.5%	8	30.8%	.090
Eastern region	6	12.8%	4	66.7%	0	0.0%	2	33.3%	
Western region	15	31.9%	8	53.3%	1	6.7%	6	40.0%	
Is your program a joint program?									
Yes	21	44.7%	11	52.4%	4	19.0%	6	28.6%	.472
No	26	55.3%	9	34.6%	7	26.9%	10	38.5%	
How many residents now participate in your program?									
1–5	23	48.9%	14	60.9%	4	17.4%	5	21.7%	.177 [§]
6–10	13	27.7%	3	23.1%	4	30.8%	6	46.2%	
11–14	11	23.4%	3	27.3%	3	27.3%	5	45.5%	
How many cardiac surgery fellows are currently training in your center?									
0	40	85.1%	17	42.5%	8	20.0%	15	37.5%	.449 [§]
1	2	4.3%	1	50.0%	0	0.0%	1	50.0%	
2	2	4.3%	1	50.0%	1	50.0%	0	0.0%	
3	3	6.4%	1	33.3%	2	66.7%	0	0.0%	
On average, how many hours per week do you currently work in your PGY?									
<60	6	12.8%	5	83.3%	1	16.7%	0	0.0%	.212 [§]
60–90	33	70.2%	13	39.4%	8	24.2%	12	36.4%	
>90	8	17.0%	2	25.0%	2	25.0%	4	50.0%	
On average, how many overnight shifts do you work per month in your current PGY?									
4 or less	17	36.2%	9	52.9%	4	23.5%	4	23.5%	.518
5–6	20	42.6%	9	45.0%	4	20.0%	7	35.0%	
7–8	10	21.3%	2	20.0%	3	30.0%	5	50.0%	
Which year is the most clinically demanding in your program?									
Core general surgery	9	19.1%	5	55.6%	0	0.0%	4	44.4%	.319 [§]
Junior cardiac surgery	16	34.0%	5	31.3%	6	37.5%	5	31.3%	
Senior cardiac surgery	22	46.8%	10	45.5%	5	22.7%	7	31.8%	
The faculty and staff of my program are concerned about my educational success									
Strongly disagree	2	4.3%	0	0.0%	0	0.0%	2	100.0%	.001* [§]
Disagree	4	8.5%	0	0.0%	1	25.0%	3	75.0%	
Neutral	11	23.4%	0	0.0%	3	27.3%	8	72.7%	
Agree	21	44.7%	11	52.4%	7	33.3%	3	14.3%	
Strongly agree	9	19.1%	9	100.0%	0	0.0%	0	0.0%	
My program makes constructive use of resident feedback									
Strongly disagree	2	4.3%	0	0.0%	0	0.0%	2	100.0%	.007* [§]
Disagree	8	17.0%	2	25.0%	1	12.5%	5	62.5%	
Neutral	18	38.3%	5	27.8%	6	33.3%	7	38.9%	
Agree	11	23.4%	5	45.5%	4	36.4%	2	18.2%	
Strongly agree	8	17.0%	8	100.0%	0	0.0%	0	0.0%	
I am capable of having an appropriate work-life balance									
Strongly disagree	3	6.4%	1	33.3%	0	0.0%	2	66.7%	.381 [§]
Disagree	11	23.4%	2	18.2%	5	45.5%	4	36.4%	
Neutral	12	25.5%	5	41.7%	2	16.7%	5	41.7%	
Agree	18	38.3%	10	55.6%	4	22.2%	4	22.2%	
Strongly agree	3	6.4%	2	66.7%	0	0.0%	1	33.3%	

Table 2 (continued)

Program characteristics	Total		Level of training satisfaction						p value
			Satisfied		Neutral		Dissatisfied		
	No	%	No	%	No	%	No	%	
My work load often causes me a lot of stress									
Strongly disagree	1	2.1%	0	0.0%	0	0.0%	1	100.0%	.585 [§]
Disagree	9	19.1%	6	66.7%	1	11.1%	2	22.2%	
Neutral	16	34.0%	8	50.0%	4	25.0%	4	25.0%	
Agree	18	38.3%	5	27.8%	5	27.8%	8	44.4%	
Strongly agree	3	6.4%	1	33.3%	1	33.3%	1	33.3%	
I would pick the same cardiac surgery residency program again if I had the chance									
Strongly disagree	2	4.3%	0	0.0%	1	50.0%	1	50.0%	.018* [§]
Disagree	4	8.5%	2	50.0%	0	0.0%	2	50.0%	
Neutral	12	25.5%	1	8.3%	3	25.0%	8	66.7%	
Agree	9	19.1%	3	33.3%	4	44.4%	2	22.2%	
Strongly agree	20	42.6%	14	70.0%	3	15.0%	3	15.0%	
I feel there is a lot of ambiguity and vagueness in the program									
Strongly disagree	1	2.1%	1	100.0%	0	0.0%	0	0.0%	.176 [§]
Disagree	12	25.5%	8	66.7%	3	25.0%	1	8.3%	
Neutral	15	31.9%	7	46.7%	3	20.0%	5	33.3%	
Agree	12	25.5%	3	25.0%	4	33.3%	5	41.7%	
Strongly agree	7	14.9%	1	14.3%	1	14.3%	5	71.4%	
My program offers enough research opportunities									
Strongly disagree	3	6.4%	0	0.0%	1	33.3%	2	66.7%	.327 [§]
Disagree	6	12.8%	1	16.7%	2	33.3%	3	50.0%	
Neutral	13	27.7%	6	46.2%	1	7.7%	6	46.2%	
Agree	12	25.5%	5	41.7%	4	33.3%	3	25.0%	
Strongly agree	13	27.7%	8	61.5%	3	23.1%	2	15.4%	

P Pearson χ^2 test[§] Exact probability test* $P < 0.05$ (significant)

Cardiac Surgery program, 23.4% were neutral, and 34.0% were dissatisfied. Furthermore, suggestions to improve a single aspect of the Saudi Board Cardiac Surgery Residency Program; the majority of residents (63.8%) mentioned improving surgical experience, while other aspects included workplace climate (8.5%), mentorship (6.4%), and teaching quality (6.4%) (Figs. 1 and 2).

Discussion

The Cardiac Surgery Training Program in Saudi Arabia has been only available to accept residents starting in 2011 [1], which is considered to be a recent period. This is the first study looking at residents' satisfaction with the Saudi Cardiac Surgery Training Program. As the Board of Cardiac Surgery is a newly established training program, we aimed to provide valuable data and informative considerations in order to improve the overall quality of the local cardiac training program,

since the degree of trainees satisfaction is coupled with their productivity in a direct relationship [7].

A total of 47 cardiac surgery residents were included in this study. Most of the residents were males (61.7%), while females cardiothoracic surgeons represented about one-third (38.3%) of the participants. Gender equity of trainees in cardiothoracic surgery is still not established as per Cerqueira et al. [6]. Our results are demonstrating a decreased level of satisfaction. 34% of residents are dissatisfied with the training program, which represents more than double the percentage mentioned in a previous research, where 15% of the trainees were dissatisfied with the Saudi plastic surgery program [7]. Residents of the General Surgery Saudi Board have also reported a high level of dissatisfaction with their training program in two different studies, varying from 44% in the eastern region [8] to 78% in the central region [9].

Table 3 Conceptual education in relation to the overall satisfaction with the Saudi Board Cardiac Surgery Residency Program

Conceptual education	Total		Level of training satisfaction						p value
	No	%	Satisfied		Neutral		Dissatisfied		
			No	%	No	%	No	%	
Do you use any external sources, such as videos, to understand concepts?									
Yes	39	83.0%	14	35.9%	11	28.2%	14	35.9%	.087
Sometimes	8	17.0%	6	75.0%	0	0.0%	2	25.0%	
Do you find difficulty understanding cardiac surgery related concepts?									
Yes	4	8.5%	1	25.0%	1	25.0%	2	50.0%	.846 [§]
Sometimes	31	66.0%	14	45.2%	8	25.8%	9	29.0%	
No	12	25.5%	5	41.7%	2	16.7%	5	41.7%	
Do you find a mentor available to help you understand the complexities?									
Yes	25	53.2%	15	60.0%	7	28.0%	3	12.0%	.006*
Sometimes	14	29.8%	5	35.7%	2	14.3%	7	50.0%	
No	8	17.0%	0	0.0%	2	25.0%	6	75.0%	
How many teaching activities are done weekly in your program?									
1	21	44.7%	8	38.1%	4	19.0%	9	42.9%	.600 [§]
2	17	36.2%	9	52.9%	5	29.4%	3	17.6%	
3	2	4.3%	0	0.0%	1	50.0%	1	50.0%	
4	1	2.1%	1	100.0%	0	0.0%	0	0.0%	
5	6	12.8%	2	33.3%	1	16.7%	3	50.0%	
Do you find the teaching activities beneficial?									
1	3	6.4%	0	0.0%	0	0.0%	3	100.0%	.014* [§]
2	6	12.8%	0	0.0%	2	33.3%	4	66.7%	
3	14	29.8%	4	28.6%	5	35.7%	5	35.7%	
4	14	29.8%	8	57.1%	3	21.4%	3	21.4%	
5	10	21.3%	8	80.0%	1	10.0%	1	10.0%	
How often do you get academic instruction from attending physicians									
Rarely	7	14.9%	0	0.0%	1	14.3%	6	85.7%	.003* [§]
Sometimes	17	36.2%	4	23.5%	5	29.4%	8	47.1%	
Often	19	40.4%	13	68.4%	4	21.1%	2	10.5%	
Always	4	8.5%	3	75.0%	1	25.0%	0	0.0%	
Do you get feedback from the department head and attending doctors?									
Yes, it helps me advance	18	38.3%	15	83.3%	2	11.1%	1	5.6%	.001* [§]
Yes, but not enough	20	42.6%	4	20.0%	7	35.0%	9	45.0%	
No, I wish I did	7	14.9%	1	14.3%	2	28.6%	4	57.1%	
No, but I do not need it	2	4.3%	0	0.0%	0	0.0%	2	100.0%	
How often were attending too busy to discuss patient problems with you in a timely manner?									
Never	2	4.3%	0	0.0%	1	50.0%	1	50.0%	.013* [§]
Rarely	15	31.9%	11	73.3%	3	20.0%	1	6.7%	
Sometimes	12	25.5%	6	50.0%	1	8.3%	5	41.7%	
Often	15	31.9%	3	20.0%	6	40.0%	6	40.0%	
Always	3	6.4%	0	0.0%	0	0.0%	3	100.0%	
What is your preferred learning modality?									
Attendings' patients/case	30	63.8%	14	46.7%	7	23.3%	9	30.0%	.817 [§]
Books/journals	8	17.0%	2	25.0%	2	25.0%	4	50.0%	
Conferences/lectures	3	6.4%	2	66.7%	0	0.0%	1	33.3%	
Virtual learning	6	12.8%	2	33.3%	2	33.3%	2	33.3%	
What teaching modality is most used by your training center?									
Attendings' patients/case	25	53.2%	13	52.0%	9	36.0%	3	12.0%	.008* [§]
Books/journals	2	4.3%	0	0.0%	1	50.0%	1	50.0%	
Conferences/lectures	12	25.5%	6	50.0%	0	0.0%	6	50.0%	
Virtual learning	8	17.0%	1	12.5%	1	12.5%	6	75.0%	

P Pearson χ^2 test

§ Exact probability test

* $P < 0.05$ (significant)

Table 4 Surgical education in relation to the overall satisfaction regarding Saudi Board Cardiac Surgery Residency Program

Surgical education	Total		Level of training satisfaction						p value
			Satisfied		Neutral		Dissatisfied		
	No	%	No	%	No	%	No	%	
How often do you get surgical instructions in the operating room from attending physicians?									
Never	2	4.3%	0	0.0%	0	0.0%	2	100.0%	.001* [§]
Rarely	7	14.9%	1	14.3%	1	14.3%	5	71.4%	
Sometimes	11	23.4%	0	0.0%	5	45.5%	6	54.5%	
Often	13	27.7%	9	69.2%	2	15.4%	2	15.4%	
Always	14	29.8%	10	71.4%	3	21.4%	1	7.1%	
Do you benefit from intra-operative teaching?									
1	1	2.1%	0	0.0%	0	0.0%	1	100.0%	.008* [§]
2	5	10.6%	0	0.0%	0	0.0%	5	100.0%	
3	6	12.8%	1	16.7%	3	50.0%	2	33.3%	
4	12	25.5%	4	33.3%	3	25.0%	5	41.7%	
5	23	48.9%	15	65.2%	5	21.7%	3	13.0%	
Do you prefer explanatory surgical videos of the operations more than intra-operative teaching?									
Yes	9	19.1%	3	33.3%	1	11.1%	5	55.6%	.293
No	38	80.9%	17	44.7%	10	26.3%	11	28.9%	
Do you find difficulties in certain surgical skills?									
Yes	32	68.1%	13	40.6%	7	21.9%	12	37.5%	.763
No	15	31.9%	7	46.7%	4	26.7%	4	26.7%	
Is there an available mentor to help you in practicing surgical skills that you struggle in?									
Yes	17	36.2%	13	76.5%	2	11.8%	2	11.8%	.001* [§]
Often	17	36.2%	6	35.3%	7	41.2%	4	23.5%	
Seldom	6	12.8%	1	16.7%	1	16.7%	4	66.7%	
No	7	14.9%	0	0.0%	1	14.3%	6	85.7%	
Do you find the educational curriculum in your cardiac surgery program satisfactory?									
1	5	10.6%	0	0.0%	0	0.0%	5	100.0%	.001* [§]
2	8	17.0%	0	0.0%	2	25.0%	6	75.0%	
3	22	46.8%	8	36.4%	9	40.9%	5	22.7%	
4	6	12.8%	6	100.0%	0	0.0%	0	0.0%	
5	6	12.8%	6	100.0%	0	0.0%	0	0.0%	
How many surgeries/months under general anesthesia do you perform as an assistant or primary surgeon?									
No	8	17.0%	1	12.5%	1	12.5%	6	75.0%	.040* [§]
< 5	11	23.4%	2	18.2%	5	45.5%	4	36.4%	
5–10	10	21.3%	5	50.0%	3	30.0%	2	20.0%	
10–15	6	12.8%	3	50.0%	1	16.7%	2	33.3%	
> 15	12	25.5%	9	75.0%	1	8.3%	2	16.7%	
How many surgeries/months under general anesthesia do you perform as primary surgeon?									
No	34	72.3%	13	38.2%	8	23.5%	13	38.2%	.467 [§]
< 5	9	19.1%	4	44.4%	2	22.2%	3	33.3%	
5–10	2	4.3%	2	100.0%	0	0.0%	0	0.0%	
10–15	1	2.1%	1	100.0%	0	0.0%	0	0.0%	
> 15	1	2.1%	0	0.0%	1	100.0%	0	0.0%	
Do you participate in complex procedures?									
Yes	14	29.8%	8	57.1%	4	28.6%	2	14.3%	.239
Partially	27	57.4%	11	40.7%	6	22.2%	10	37.0%	
No	6	12.8%	1	16.7%	1	16.7%	4	66.7%	

Table 4 (continued)

Surgical education	Total		Level of training satisfaction						p value
			Satisfied		Neutral		Dissatisfied		
	No	%	No	%	No	%	No	%	
Do you mark your patients preoperatively on your own?									
Yes	22	46.8%	9	40.9%	4	18.2%	9	40.9%	.747 [§]
Often	10	21.3%	4	40.0%	4	40.0%	2	20.0%	
Seldom	3	6.4%	2	66.7%	0	0.0%	1	33.3%	
No	12	25.5%	5	41.7%	3	25.0%	4	33.3%	
How often do you feel like you are inadequately supervised during a procedure?									
Never	10	21.3%	5	50.0%	1	10.0%	4	40.0%	.017* [§]
Rarely	16	34.0%	11	68.8%	2	12.5%	3	18.8%	
Sometimes	11	23.4%	4	36.4%	5	45.5%	2	18.2%	
Often	8	17.0%	0	0.0%	3	37.5%	5	62.5%	
Always	2	4.3%	0	0.0%	0	0.0%	2	100.0%	
How often do you feel like you are overly supervised during a procedure?									
Never	2	4.3%	2	100.0%	0	0.0%	0	0.0%	.022* [§]
Rarely	16	34.0%	7	43.8%	5	31.3%	4	25.0%	
Sometimes	20	42.6%	10	50.0%	6	30.0%	4	20.0%	
Often	5	10.6%	1	20.0%	0	0.0%	4	80.0%	
Always	4	8.5%	0	0.0%	0	0.0%	4	100.0%	

P Pearson χ^2 test

[§] Exact probability test

* P < 0.05 (significant)

Table 5 Residents' perceptions of overall satisfaction with the Saudi Board Cardiac Surgery Residency Program

Satisfaction	Total		Level of training satisfaction						p value
			Satisfied		Neutral		Dissatisfied		
	No	%	No	%	No	%	No	%	
Are you happy with your current caseload?									
Yes	20	42.6%	15	75.0%	2	10.0%	3	15.0%	.001*
No, I would like to be involved in more cases	27	57.4%	5	18.5%	9	33.3%	13	48.1%	
Is the number of residents in your department optimal?									
Yes, it is optimal	29	61.7%	14	48.3%	5	17.2%	10	34.5%	.347 [§]
No, it should be raised to ease the daily load	3	6.4%	2	66.7%	0	0.0%	1	33.3%	
No, it should be lowered so each could operate more	15	31.9%	4	26.7%	6	40.0%	5	33.3%	
How satisfied are you regarding the number of cardiac surgeries you are exposed to?									
1	9	19.1%	0	0.0%	2	22.2%	7	77.8%	.001*
2	8	17.0%	1	12.5%	2	25.0%	5	62.5%	
3	11	23.4%	3	27.3%	5	45.5%	3	27.3%	
4	13	27.7%	11	84.6%	2	15.4%	0	0.0%	
5	6	12.8%	5	83.3%	0	0.0%	1	16.7%	
Do you think you'll be able to do surgeries on your own by the end of the residency?									
Yes	16	34.0%	15	93.8%	0	0.0%	1	6.3%	.001* [§]
Partially	21	44.7%	5	23.8%	8	38.1%	8	38.1%	
No	10	21.3%	0	0.0%	3	30.0%	7	70.0%	

P Pearson χ^2 test

[§] Exact probability test

* P < 0.05 (significant)

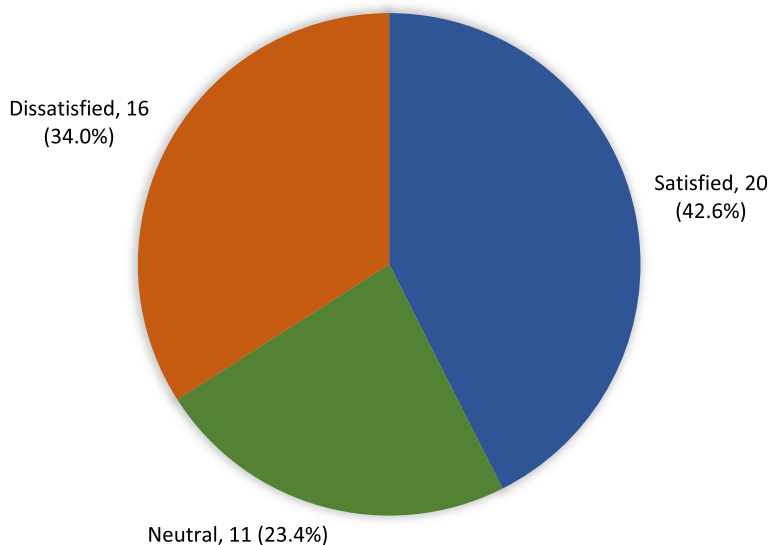


Fig. 1 Level of satisfaction of cardiac surgery trainees with the residency training program in Saudi Arabia

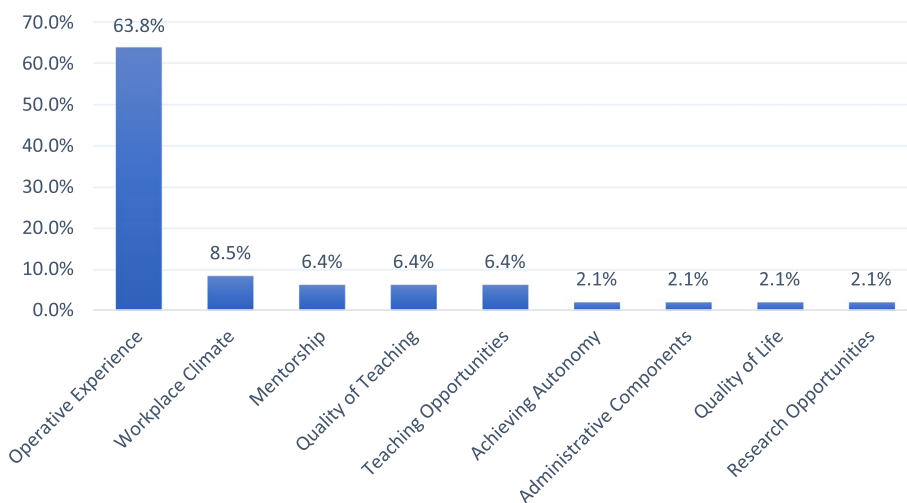


Fig. 2 Suggestions to improve one aspect of the Saudi Board Cardiac Surgery Residency Program

When relating to resident’s satisfaction regarding the surgical education, almost all factors were significantly associated with resident’s satisfaction level ($P < 0.05$). 42.6% of residents needed more instructions in the operating theatre and (40.4%) of residents needed more surgical experience as they have assisted in less than 5 surgeries per month, or not at all. 59.5% of the residents are not satisfied with the amount of cardiac surgery they are exposed to, and that was supported by the most (63.8%) suggested area for improvement is operative exposure. In comparison to another study in a Europe-wide survey, only 37.6% of the residents are not satisfied with the surgical exposure they receive [6]. The notable

limitations of education within the operating room drew attention to the use of simulation-based training, which is a new learning tool that increases the efficiency of the trained surgeon’s performance inside the operating room while maintaining a high level of patient safety. Feins et al. has implemented simulation-based learning among first year cardiac surgery residents, and practice repetitions showed improvement with excellent final scores for many cardiothoracic procedures such as cardiopulmonary bypass and aortic valve replacement [10]. In the experience of a Boot Camp, another study has showed improvement in the ability of cardiothoracic residents to preform coronary artery anastomosis with use of a

portable task station and a porcine heart model [11]. In Saudi Arabia, Boot Camps have also showed statistically significant improvement in knowledge among intern pharmacy students [12]. Thus, implementing simulation-based surgical learnings and providing more frequent exposure to Boot Camp experience in cardiac surgery is recommended.

The frequency of surgical instructions and the attending physician's adequacy of supervision inside the operating room, as well as the ability to find a mentor to assist in understanding difficult concepts and receiving feedback, were all significantly related to residents' satisfaction ($P < 0.05$). Al Shanafey et al. reported more than half (51%) of the Saudi Surgical Board trainees are in need of a constant mentor, and the percentage of consultants who were committed to mentoring their residents was only (40%) [9]. Mentoring is an essential part of the learning process [13], and one-to-one type of interaction is more preferred by the trainees and one of the most important teaching techniques over group activities [13, 14]. Fortunately, theoretical education in our results reflected a positive mentorship and only (6.4%) of the residents suggested it be improved, while (63.8%) of residents agreed that faculty and staff do care about their educational success. In contrast with another study conducted in Saudi Arabia, more than (30%) of local plastic surgery residents suggested mentorship to be improved [7]. Mentor is operational skills, their approachability, and teaching style of the mentor are the most preferred traits by the residents [15]. Our finds show that adequate and constant mentoring, and constructed feedback, represents a valuable resource for improvement theoretically and surgically.

To provide an indication of where the most focus is required for the local cardiac surgery training program, we have given the chance to the trainees to anonymously discuss their concerns and stressors. Few yet valuable concerns were expressed by many of the residents, as workload and lack of surgical skills and pre-operative discussions. Higher workload is associated with many negative outcomes, such as anxiety, sleep deprivation, and decreased level of satisfaction with the training program [16], and wellness activities are a well-established recommendation to decrease trainees' burnout risks and to increase their productivity level [17]. Reported wellness initiatives such as dedicated lectures that teach trainees how to improve resilience and to overcome burnout [18], interventions and strategies aiming towards increasing the level of clinical competence and related self-confidence of the trainees [19], together with the presence of wellness faculty champion and other interventions, did actually improve the prevalence of burnout among surgical trainees [20]. Residents' preparedness was insured

by using the "nightly pre-operative huddle e-mail," where the operating trainee is responsible for sending an e-mail message to the entire surgical team, composed of a review and final plan of the case, in addition to the pre-operative discussion between the trainee and the attending physician [21]. 21.3% reported concerns for not being able to stand independently as a cardiac surgeon at the end of the training program and (44.7%) are partially not sure, meaning (66%) of residents total are not confident as a result of their lack of surgical exposure. Luthra et al. has aimed to assess the cardiac surgery residency training program safety through comparison of trainees versus consultants' cases outcomes, and concluded that the training of cardiac surgery residents is safe and patient care quality was not compromised [22]. Hence, a more active teaching style in the operating room is recommended.

Our study presents some limitations, as our study is cross-sectional with potential risk for bias. Despite these limitations, our findings open great room for improvement, providing program directors and the SCFHS a feasible opportunity to augment the local Cardiac Surgery Training Program.

Conclusions

Our results demonstrate a decreased level of satisfaction with the training program. This is important because it directly affects how productive and effective they are as trainees. Adjustments in the working environment and operative experience are required to further enhance the training program's quality. Keeping updated as well and identifying the areas that need the most work can direct us toward improving the standard of instruction and, ultimately, increase trainee satisfaction.

Abbreviations

SCFHS	Saudi Commission for Health Specialties
SaudiMED-CS	Saudi Medical Education Directions for Cardiac Surgery training program
CanMEDS	Canadian Medical Education Directives for Specialists framework
SPSS	Statistical Packages for Social Sciences
PGY	Postgraduate year

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Authors' contributions

OA and RB designed the study. RB, NA, and AA conducted literature search, MA, MB, and EA acquired and analyzed data. All authors read and approved the final manuscript.

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Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations**Ethics approval and consent to participate**

This study approved by the Institutional Research Board of King Abdullah Medical City, Makkah. (15-Feb-2022) (Approval No. H-02-K-001–22-978-). All the participants have been informed that no identifying information is needed, and the consent was taken from them.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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